

Developing a learner centered environment to meet the needs of a growing urban commuter student population

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Abstract

The Colleges of Engineering and Science at the University of Texas at El Paso have developed a multi-faceted system based on peer support to address the particular needs of science and engineering majors. At the core of this strategy is a strong commitment to develop the critical thinking and leadership skills of a selected cohort of undergraduate students. These students act as peer mentors, tutors, team leaders, and role models for the undergraduate science and engineering student population. A synergistic effort is achieved by bringing together the resources of the Academic Center for Engineers and Scientists (ACES), the Research Experience for Undergraduates (REU) program, and the Circles of Learning for Entering Students (CircLES). Through the use of existing facilities and services available at ACES, a wide network of mentoring, coaching, and tutoring has become the principal support system for a large student commuter population. In this article we will discuss the development of this successful peer support system, the synergy generated by the ACES, REU, and CircLES staff, and the outcome of the effort.

1. Introduction

The student population at the University of Texas at El Paso (UTEP) has gradually changed over the past twenty-five years [1]. Current student demographics make UTEP the largest Mexican-American serving institution in the nation (See Table 1). Its mission is to serve the economically underdeveloped region from which it draws most of its students. In 1995, the National Science Foundation and the National Aeronautics and Space Administration recognized this effort and designated UTEP as one of six minority-serving Model Institutions for Excellence (MIE) nationwide. UTEP was charged with the development of pathways for the success of under-represented minorities pursuing baccalaureate degrees in science, technology, engineering, and mathematics.

Table 1. Historical UTEP Student Demographics.

Fall Semester	Percent Caucasian	Percent Hispanic
1975	54.4	34.8
1983	43.8	45.5
2002	12.7	71.1

As a Model Institution for Excellence, UTEP has implemented several initiatives to increase the persistence and graduation rates of engineering and science majors. Three of these initiatives focus on student development and have developed a strong synergy (see Figure 1). The initiatives are the Academic Center for Engineers and Scientists (ACES), the Circles of Learning for Entering Students (CircLES) Program, and the Research Experience for Undergraduates (REU) Program. As a whole, these initiatives promote a learner-centered environment in which carefully selected students take on critical leadership roles. These students serve in three capacities: management of an academic center, peer orientation and mentoring, and science and engineering tutoring. The following paragraphs discuss in detail these leadership roles and how students benefit from these experiences.

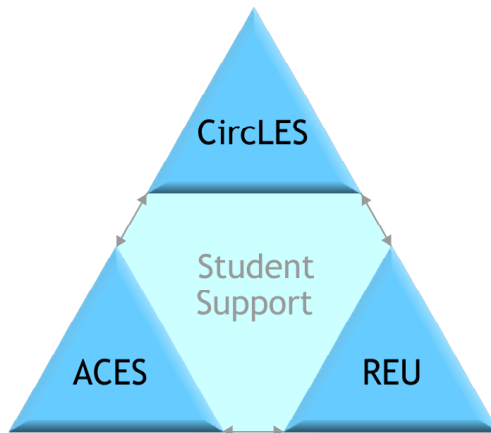


Figure 1. Synergy of the MIE initiatives focusing on student development.

2. Academic Center Management Activities

UTEP has created three multi-functional, state-of-the-art facilities to serve the needs of undergraduate engineering and science students. These facilities, which jointly constitute the Academic Center for Engineers and Scientists (ACES), are student support facilities intended to serve as hubs for engineering and science student activities. ACES provides comfortable, well-equipped spaces for group and individual study, meetings, workshops, and symposia, as well as places to relax and meet with other students. The Center includes active learning and specialized classroom facilities, quiet study areas, multi-purpose rooms, computer workrooms, lounges and vending café facilities (see Figure 2).

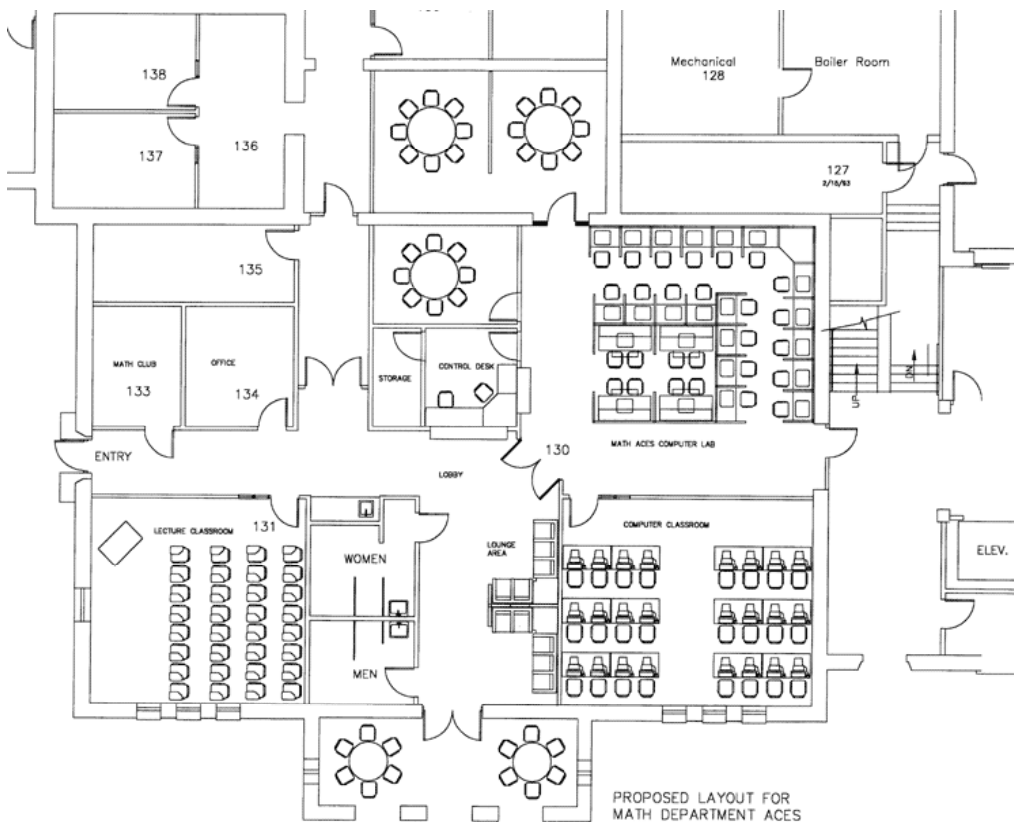


Figure 2. Blueprint of ACES showing its multipurpose design.

The Center also serves as a clearinghouse for information regarding graduate and professional schools, scholarships, undergraduate research assistantships, and employment opportunities [2].

As a concept, ACES is a reflection of systemic change in the preparation of engineering and science students well into the 21st Century. It signifies a change in academic culture that values integration as well as specialization, teamwork, individual achievement, educational innovation as well as research. ACES fosters the building and refinement of intellectual skills needed by practicing engineers and scientists [3].

The motto of ACES is “a center run by students for students,” which indicates that student employees are responsible for the day-to-day operations of the Center as well as for providing workshops, running a website, manning a tutoring center and publishing a monthly newsletter. For student employees, ACES has provided a challenging environment that has enhanced their personal, academic, and professional growth through valuable work experience [4]. Their training experience commences at the beginning of each semester. These student employees attend intensive interactive training sessions with topics from quality customer service, team-building, learning styles awareness, sexual

harassment in the workplace, and daily task training. More seasoned members mentor the recent employees to get them acclimated to the positive working environment that has been established. The ACES working motto reminds student team members that they are there to help others. When given the tools necessary to be helpful, the student team members contribute a positive and generous attitude to the workplace that is inviting to other students.

On a commuter campus, such as UTEP, a center like ACES is a crucial focal point for students who have very few commonalities in their daily schedules to meet and congregate. The flexible operating hours at ACES, along with the student population that it serves (science, mathematics and engineering majors) allows new opportunities for students with similar majors to network and work together. The Center also provides valuable services such as laptop checkout and access to computer workstations and presentation equipment to prepare for class presentations. It is also a venue for workshops targeted at reaching students who need assistance in various areas (e.g. résumé writing, how to create a webpage, interviewing skills, how to apply for scholarships.) Remembering that over 80% of our students are first generation college students who need support and advice from professional sources at the University, ACES serves as a hub of activity for students with very different needs. There is study space available for groups or individuals, conducive to both active learning and quiet study. For commuter students with very little free time, ACES is a convenient stop for on-the-go STEM majors to get the support they need. Through other support programs, such as CircLES, students can make the initial connection to other students in their majors early on in their academic careers to reap the maximum benefit of utilizing the ACES center.

Before the second facility was developed in our Physical Sciences Building, students would utilize hallway space for studying by bringing in old tables and chairs and setting them up to study in groups and tutor one another. Since the students were already in close proximity to the area, and new requirements for a computer component in each of the introductory physics and chemistry courses were eminent, plans for Physical Science ACES began to take shape. Designs for the site included a computer studio classroom equipped with desktop computers for students taking physics and chemistry courses to utilize, a tutoring room for tutors to have a common place to help students in these courses, an active learning center where students could meet to work in groups or alone in a comfortable space, and a lobby area where students would be able to relax, study, and perhaps enjoy a snack. This area has become highly utilized by students who are enrolled in the introductory chemistry and physics courses.

In May of 2003, a new ACES site will open to provide pre-college and freshman-level mathematics tutoring services to a growing entering student population. The Department of Mathematics will be responsible for operating the center and use best practices from previous ACES facilities. Departmental ownership of the center will bring this ACES one step closer to institutionalization of the entire model. The College of Science has already requested that a student fee be implemented for engineering and science majors to be able to support tutors year-round for the facility.

The operating budget of ACES is approximately \$300,000 per year or \$100 per student per year. Currently, ACES is almost completely funded by the National Science Foundation, but small strides are being made to support some of the centers activities and operating costs by charging for services such as printing in the computer labs. The charges imposed on the students are being placed in an account that is used to purchase consumable supplies such as paper and printer toner. One way to fund the cost of the center in the future would be to assess a \$50.00 student fee for all science and engineering majors per semester at registration.

3. Orientation and Mentoring Activities

CircLES is a program that assists entering students in the difficult transition from High School to College. CircLES offers summer orientation sessions, course clustering, and proactive advising. Students who work for the CircLES program serve as orientation leaders during the summer and as peer facilitators in freshman courses during the academic year. These students are undergraduate science and engineering majors who interview for open positions, are hired and spend a spring semester attending training sessions together on topics pertaining to general university information as well as specific programs and services that are available to science and engineering majors. As orientation leaders, they assist incoming freshmen and transfer students in acclimating to college life at UTEP. They also rely on their own personal experiences to offer support to the students in their orientation session. More specifically, they assist them in assimilating into the Colleges of Science and Engineering. Through carefully planned orientation activities, such as course catalog tutorials, math reviews for placement tests, campus tours and completion of technical group projects, new students can feel better prepared for the demands of science and engineering majors. Orientation activities have always included tours of ACES to bring students through the center and have them familiarize themselves with their new surroundings. Students use the facilities while they are filling out surveys and working on their group projects that they present to their orientation group at the end of their weeklong orientation. By using ACES, new students are encouraged to use the resources available to them while participating in their group projects. This is a very similar experience to what junior and senior students in engineering courses go through. Orientation leaders and ACES team members show new students how to best use the facilities and resources during the time that the students use the Center. The one-week orientation affords students the opportunity to begin building mentoring relationships with their orientation leaders, and build connections to university resources.

When orientation is over and the fall semester begins, orientation leaders transition into peer facilitators in freshman gateway courses. Since the fall of 2002, ACES has served as the main site where the peer facilitators hold office hours to assist students with assignments and questions they may have about their classes. This encourages new students to continue to frequent ACES after orientation. Office hours are held on the same floor where the tutoring center is located, so entering students have to walk by the tutoring center on their way to their peer facilitator's office. ACES and REU tutors

manage the tutoring center during the Centers' operating hours. Any science and engineering major may take advantage of the tutoring center services that include help with subjects from pre-calculus, advanced calculus, general chemistry and physics, as well as engineering courses.

4. Peer Tutoring Activities

The purpose and primary goal of the REU program is to create a pathway to graduate school for math, science, and engineering students through participation in undergraduate research. A selection committee made up of faculty representing ten science and engineering departments screens students who apply for this program. Students must meet certain criteria when applying to the program including a cumulative grade point average of 3.0/4.0 or better and full-time enrollment status at the university. Students must also provide a statement of purpose, letters of recommendation, and a current résumé. Students who are selected to this program are engaged in an academic-year research project under the supervision of a professor [5]. In return, students receive quarterly stipends as compensation for their work. In any given week, REU students average 17 hours of research and 3 hours of campus service. Service can take on several forms, but a number of these students serve as tutors for freshmen and sophomores at the ACES Centers.

Once students are selected, they must abide by a contract. Research and tutoring are the main requirements for participation in the program. Other requirements range from attending informational workshops on graduate school, résumé writing, GRE, and summer research opportunities. In addition, every student in the REU program who has more than one year to graduation is expected to apply to at least three summer programs every year. If students are graduating, they are required to apply to the GEM Fellowship and two graduate schools. During the spring semester, every student in the REU program is expected to participate in the annual Research Expo held on campus.

At the beginning of every semester, the ACES assistant director and the REU coordinator meet to select REU students who have demonstrated exemplary academic performance through their résumé and transcript and are good candidates to become tutors. Through a contract these REU students agree to mentor other engineering and science students. The REU students are then placed at one of the three ACES sites on campus and tutor for three or more clock hours per week. There are synergistic benefits to this collaboration. REU students already have a solid background in academic areas in which lower division students might be struggling. With the hours that they spend tutoring, they contribute needed contact time with students who need help from experienced and knowledgeable students. This relieves some of the demand on the hourly ACES tutors without having to pay an hourly salary for additional student staff. ACES and REU first implemented this collaborative effort in the spring of 2002. That semester alone, a total of 935 tutoring sessions were reported. (See Tables 2 and 3.) REU students alone accounted for 100 tutoring sessions.

Including REU students in the ACES operation has given them the additional benefit of gaining social and communication skills as they learn to share their knowledge and experience with other students. Future plans include periodic training of REU students to improve their tutoring skills. This will ensure that the REU students will have the necessary tools to effectively provide quality service under the ACES umbrella.

Table 2. Physical Science (PS) Site (Spring 2002) Tutoring Sessions

	January	February	March	April	May
Chemistry	63	122	47	116	0
Biology	1	0	0	0	0
Physics	27	32	26	10	3
Math	3	5	4	6	0
Other	0	3	0	0	0
Totals	94	162	77	132	3

Table 3. Classroom Building (Spring 2002) Tutoring Sessions

	January	February	March	April	May
Chemistry	4	6	13	13	3
Biology	0	2	2	3	1
Physics	18	47	18	36	0
Math	16	57	37	35	6
Probability	2		1	0	0
EE	10	28	0	3	0
Other	1	2	2	1	0
Total	51	142	73	91	10

Conclusion

By optimizing the use of resources that are already available on campus, the MIE Program provides services that will ultimately have an impact on the persistence of science and engineering students. The joint efforts of ACES, REU, and CircLES provide an innovative way of collaborating, training, and developing student leaders. As students participate and become involved in MIE activities, they develop technical, research, and professional skills to which they might not have been exposed. These experiences promote professional growth and make students aware that by helping and serving others they strengthen the learning community of which they are a part.

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